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APPLICATION FOR LETTERS PATENT

BY

Patrick D. Bradd
20 College Road
Maidenhead, Berkshire
SL6 6BN, United Kingdom

Bryan J. Miller
12 Cannondown Cottages
Maidenhead Road, Cookham
Berkshire, SL6 9EA
United Kingdom

and

James Shields
145 Victoria Road
Wargrave, Reading
Berkshire, RG10 8AG
Unite Kingdom

FOR

VOICE OVER PACKET NETWORK ARRANGEMENT AND METHOD

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VOICE OVER PACKET NETWORK ARRANGEMENT AND METHOD

FIELD OF THE INVENTION

This invention relates to arrangements and methods for call establishment in voice over IP and voice over ATM networks.

BACKGROUND TO THE INVENTION

A recent development in the communications field has been the introduction of networks providing voice over IP (VoIP) and voice over ATM services. The advantage to users is the significant reduction in costs, particularly for calls set up over long distances which can often be billed at local call rates. In such networks, a PTT/AO network interfaces with a managed IP network via one or more media gateways, which gateways are managed by media gateway controllers.

In the simplest architecture, a single media gateway controller (MGC) controls a number of media gateways (MG). This architecture, while valid for some call-types, will not become the predominant topology in voice over IP or voice over ATM networks, for a number of reasons. Firstly, a single media gateway controller will not have the capacity to control all media gateways in a large network. Secondly, for regulatory reasons in some countries, a media gateway controller will have to be located in the same country as those media gateways that it controls. Thirdly, service providers are now demanding vendor interoperability with media gateway controller from more than one vendor in their networks. Interoperability between service providers will be also required, with media gateway controllers and media gateways from more than one service provider communicating with each other.

If this interoperability is to be achieved, then a number of key issues will first have to be addressed. Specifically, these are:-

a) Communication between Media Gateways from different vendors for the bearer path for VoIP and VoATM.

b) Communication between a media gateway controller from one vendor and a media gateway from another vendor.

c) Communication between a media gateway controller from one vendor and a media gateway controller from another vendor.

Currently, in the industry, the standards to achieve the first requirement (a) are pretty much in place. A codec (such as G.711), transported in RTP (rapid transport protocol), carried on UDP (user data protocol), on top of IP for VoIP is the currently recognized industry standard.

An industry standard for the second requirement (b) is also nearing acceptance. While there are many device control protocols (SGCP, IPDC, MGCP, MEGACO, and, of course, some proprietary ones, vendor interoperability between media gateway controllers and media gateways is generally achievable.

The third requirement (c) is however a much more difficult issue. A number of options have been tentatively proposed, but none of these has provided a satisfactory solution. One such proposal is the extension of ISUP to carry bearer information. This is referred to as ISUP+, or Q.BIC. Current proposals suggest the use of the CCS7 network for carriage of this information, but many service providers do not want to involve a CCS7 network in their Voice over Packet network design. Another proposed solution is that of changing the session initiation protocol SIP (RFC 2543) to allow carriage of both SDP (RFC 2327) and CCS7 user part information to allow PSTN interconnect and transparency, and using this information as the media gateway controller to media gateway controller (MGC to MGC) communication protocol. This is typically referred to as SIP BCP T (SIP Best Common Practices for Telephony). While this effort is currently under active consideration, a ratified, working protocol has yet to be defined. A third proposal is the use of a vendor specific protocol. While this is a working solution, it is a vendor specific one, and includes information specific to the vendor specific implementation of the ICE half-call split. This information will of course be proprietary and not generally available to other vendors.

In addition to the protocol problem, a further difficulty is that the media gateway controllers developed by various vendors are designed to function in a network only if the other media gateway controllers in the network are derived from that vendor's same family of products. For example, a vendor's media gateway controller might

rely on sharing data across media gateway controllers such as translations, or trunk-groups, in order to function. Further, some vendors' media gateway controller products are designed such that one media gateway controller only deals with ingress half calls, and another media gateway controller deals with egress half calls. Intimate knowledge about how each media gateway controller works must be known by the other media gateway controller, and this of course generally precludes the use of products from another vendor. In addition, a media gateway controller will generally be designed to control both gateways.

Thus, even if a ratified protocol were to be defined, this would not fully address the problem and, in the absence of a suitable topology, would be difficult to achieve in the near term:

SUMMARY OF THE INVENTION

An object of the invention is to minimise or to overcome the above disadvantage.

A further object of the invention is to provide an improved arrangement and method for carrying narrow band traffic, e.g. voice traffic over an IP network.

According to a first aspect of the invention, there is provided a communications network arrangement providing voice over IP or voice over ATM services, the network arrangement comprising: a first media gateway controller controlling a first gateway and provided with a first operating protocol, a second media gateway controller controlling a second gateway and provided with a second operating protocol, and a gateway address translator incorporating proxies for said first and second gateways respectively, wherein said gateway address translator provides a relay function for messaging between each said media gateway controller and its corresponding gateway, and a virtual bearer function for messaging between said media gateway controllers.

According to another aspect of the invention, there is provided a method of interfacing media gateway controllers and media gateways having different operating protocols in a communications network arrangement providing voice over IP or voice over ATM services, the method comprising creating software proxies of

said gateways with which said media gateways communicate each in its respective operating protocol.

According to another aspect of the invention, there is provided a method of providing voice over IP or voice over ATM services in a communications network arrangement comprising: a first media gateway controller controlling a first gateway and provided with a first operating protocol, and a second media gateway controller controlling a second gateway and provided with a second operating protocol, the method comprising provisioning proxies of said gateways so as to provide a relay function for messaging between each said media gateway controller and its corresponding gateway, said messaging utilising the protocol of the controller and the gateway, and a virtual bearer function for enabling messaging between said media gateway controllers.

According to another aspect of the invention, there is provided a gateway address translator for use in a communications network arrangement providing voice over IP or voice over ATM services and comprising: a first media gateway controller controlling a first gateway and provided with a first operating protocol,. a second media gateway controller controlling a second gateway and provided with a second operating protocol, the gateway address translator comprising; gateway proxies, one for each said gateway, and virtual gateways, one for each said media gateway controller, wherein said gateway proxies provide a relay function for messaging between each said media gateway controller and its corresponding gateway, and wherein said virtual gateways provide a virtual bearer function for messaging between said media gateway controllers.

According to another aspect of the invention, there is provided a communications network arrangement providing voice over IP or voice over ATM services and incorporating a plurality of media gateways and media gateway controllers therefor whereby voice calls are set up over virtual channels in the network, wherein said media gateways and media gateway controllers have different operating protocols, and wherein communications between said media gateways and media gateway controllers are relayed via proxies whereby each said media gateway and media gateway controller can send and receive communications in its own protocol.

Advantageously, the gateway address translator is provided on a storage medium as software in machine readable form. Preferably, this software is installed on and runs on a gateway controller.

A media gateway controller may also comprise a soft switch or a USP/ICE – ICE/USP pair

In some applications, communication between gateway controllers may be provided via a SS7 signalling network.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described with reference to the accompanying drawings in which:-

Figure 1 is a schematic diagram of a prior art network arrangement;

Figure 2 shows a development of the network of figure 1;

Figure 3 shows a network construction according to a preferred embodiment of the invention;

Figure 4 shows the detail of a gateway address translator employed in the network of figure 3;

Figure 4a shows the gateway address translator construction in further detail;

Figure 5 is a call walkthrough diagram for the network of figure 3;

Figure 6 shows an alternative network construction; and

Figure 7 is a call walk-through diagram for the network of figure 6.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring first to figure 1, which is introduced for explanatory and comparative purposes, this shows a typical network arrangement in which a single media gateway controller 11 controls first and second media gateways 12 and 13 so as to set up PTT network originating calls via a managed IP network 14. Communication between the media gateway controller and the gateways is established via a suitable device control protocol. Calls are set up via messages passed over e.g. a CCS7 signalling path 15 to the media gateway controller 11.

Figure 2, which is also introduced for explanatory and comparative purposes, shows a development of the network of figure 1 in which a further media gateway controller 11a is introduced, e.g. to extend the geographical coverage of the network and/or to accommodate a larger number of gateways. The two media gateway controllers can communicate via the managed IP network 14 using a suitable inter-MGC communication protocol, and each can communicated with its respective gateway using a device control protocol. This however presupposes that both media gateway controllers use identical communication protocols and effectively requires that they be purchased from the same vendor.

Referring now to figure 3, this shows in schematic form an exemplary communications network arrangement according to a preferred embodiment of the invention. As shown in figure 3, the network arrangement includes a managed IP network, generally indicated as 34, to which access from one or more PTT/AO voice networks is provided via media gateways 32, 33. These gateways are supplied by different vendors and thus embody different operating protocols. Each gateway is controlled by a respective media gateway controller 31a, 31b whose protocols match those of the gateway that it is controlling. This control is effected using an appropriate device control protocol via a gateway address translator (GAT) 35. Communication between the media gateway controllers is also provided via the gateway address translator 35 which interfaces and converts the respective device control protocols used by the media gateway controllers. Each media gateway controller can thus use its own device control protocol for all communications via the gateway address translator.

Signalling to provide setup of VoIP calls is advantageously effected via a CCS7 network using an appropriate ISUP (ISDN user part) protocol for the particular administration in which the media gateway controllers are operating. The gateways provide user access to G.771/RTP traffic paths 36 via the IP network for the transport of voice over IP calls that have been set up via the CCS7 signalling network.

It will of course be understood that, for the purposes of clarity and explanation, each media gateway controller is depicted in figure 3 as controlling a single media gateway whereas, in a practical network, a media gateway controller may well control several gateways.

The gateway address translator 35, which is shown in further detail in figure 4, acts as a proxy for all media gateways in a multi-vendor, media gateway control MEGACO-style, voice over IP or voice over ATM network. The gateway address translator provides a proxy function for origination and termination gateways, and a substitute for the intermediate gateways.

There are three elements to the provisioning required to support the gateway address translator. These are:

- Provisioning the gateway address translator in place of the physical gateways at the media gateway controller, and provisioning the gateway proxies at the gateway address translator;
- Provisioning the physical gateways at the gateway address translator and associating with the gateway proxies;
- Provisioning the intermediate virtual gateways and bearer circuits at the gateway address translator.

As depicted in figure 4, the translator incorporates first and second gateway proxies 324, 334 corresponding to the respective gateways 32, 33 (figure 3), and first and second virtual gateways 325 and 326, the latter being coupled via a virtual bearer circuit 40. The address of each proxy is provisioned at the respective media gateway controller in place of that of the respective gateway so that the controller believes it is controlling that gateway directly. The address of the media gateway

controller does not need to be provisioned at the gateway address translator because the translator can extract this information when the media gateway controller registers with its gateway. This provides a two-way communication path between the gateway proxy of the gateway address translator and the media gateway controller. If the media gateway controller assumes the same well-known port is used by all gateways, a different IP address must be used for each proxy. Otherwise, different ports at the same address will be sufficient.

It will be appreciated that figure 4 is a functional diagram in which the various integers will be constituted by software entities.

Figure 4a shows the construction of the gateway address translator in further detail. Again, it will be appreciated that figure 4a is a logical or functional diagram, as the address translator will normally be constituted in software form, e.g. as machine readable operating instructions on a storage medium.

An association is also established between the virtual circuits represented by the virtual gateway elements. It is through the association of these virtual circuits that the gateway address translator is able to relate the two calls (one supervised by the first vendor's respective media gateway controller, the other supervised by the second vendor's respective media gateway controller) which have different call identifiers.

The gateway address translator forwards device control messages between the gateway address translator and the gateway. The address of the gateway, which would ordinarily be provisioned at the respective media gateway controller, is, as discussed above, provisioned at the gateway address translator. The gateway address translator manipulates device registration messages, substituting the address of the gateway proxy in place of that of the respective media gateway controller, so that the address of the gateway address translator need not be provisioned at the gateway. This provides a two-way communication path between the gateway proxy of the gateway address translator and the gateway.

The gateway address translator receives all media gateway controller (MGC) to media gateway (MG) device control commands for all gateways involved in a call,

and ensures that all gateways are aware of all the bearer information to connect VoIP streams between the gateways to establish a VoIP call. No communication between media gateway controllers containing any bearer information is therefore required and existing CCS7 messaging and CCS7 networks can be used.

The gateway address translator receives all device control messages from the media gateway controller, and responds to the media gateway controller as if the translator were the real gateway involved in the call. In effect, the media gateway controller 'thinks', wrongly, that the gateway address translator is in fact the gateway that it controls. The gateway address translator, through this proxy activity, determines what information each gateway should receive in order to properly setup the voice over IP communication.

By using the gateway address translator to proxy media gateway controller (MGC) to Media Gateway (MG) commands, communication between media gateway controllers can thus advantageously use the existing, proven CCS7 network instead of the unproven, unimplemented protocols currently being designed for media gateway controller to media gateway controller communication. As all vendors currently have diverging protocols for media gateway controller to media gateway controller communication, service providers wishing to provide a multi-vendor VoIP or VoATM network with one media gateway controller from vendor A and another media gateway controller from vendor B are now enabled to do so.

The gateway address translator advantageously comprises a software entity that can run on a separate computer platform, on a router in the IP network, or on the same computer platform running one of the media gateway controllers. Each device control protocol should provide acknowledgement of IP addresses in device control create connection messages. For example, protocols used by Nortel Networks, such as ASPEN provide for this - the gateway simply ACKs the SDP, which contains the IP address to use for the RTP stream. Protocols used by gateways from other vendors need to follow a similar convention.

A call walk-through for the network of figure 3 is illustrated in figure 5. It will of course be understood that, for clarity, figure 5 is restricted to the call setup procedure and does not depict call progress (ACM), answer or release, as these

latter features will be appreciated by the skilled worker from an understanding of the call setup process shown in the figure.

Figure 6 shows an alternative network arrangement in which one media gateway controller is constituted by a soft switch 61 supplied by one vendor and controlling a respective gateway 62, and the other media gateway controller is constituted by a distributed MGC pair (63, 65) providing separate ingress and egress functions and supplied by another vendor. As before, the gateway address translator ensures that each vendor's products can use their own messaging protocols.

Figure 7 shows a call walkthrough for the network arrangement of figure 6. Again, in the interests of clarity, the diagram has been restricted to the call setup process.

It will be appreciated that if a media gateway controller assumes the same well-known port number is used by all gateways, a different IP address must be used for each gateway proxy on the gateway address translator. Otherwise, different ports at the same address will be sufficient. If a vendor's network management system is integrated such that the gateway element manager determines the addresses of the gateways from the same provisioning data as the media gateway controller, then the gateway proxy function of the gateway address translator must also be capable of acting as proxy for maintenance messages as well as device control messages. If the vendor's network management system is integrated such that gateways must be brought in service by an element manager before circuits are available for processing by the media gateway controller, rather than assuming they're available if they succeed on registration, then the virtual gateway must be capable of spoofing the minimal service maintenance commands of the element management system (SNMP or other

It will be understood that the above description of a preferred embodiment is given by way of example only and that various modifications may be made by those skilled in the art without departing from the spirit and scope of the invention.